Manuscript Details

Manuscript number	JAD_2019_1198_R2
Title	Self-perception of physical health conditions and its association with depression and anxiety among Bangladeshi university students
Article type	Research Paper

Abstract

Background: Self-perception of physical health conditions is associated with depression and anxiety. Although some recent studies revealed a high prevalence of depression and anxiety among Bangladeshi university students, no study has yet investigated the link between self-perception of physical health and these common psychological disorders. Therefore, this study aimed to explore the association of self-perception of physical health conditions with depression and anxiety among university students in Dhaka, Bangladesh. Methods: A cross-sectional study was conducted between August and November 2017 among 897 undergraduate students of Jahangirnagar University, Dhaka through face-to-face interviews using a semi-structured questionnaire. Chi-square test and binary logistic regression analysis were used to examine the association between the variables. Results: 13.9% of the respondents had poor self-rated health (SRH) and 49.9% had self-rated body image (SRBI) dissatisfaction. 25.6% of the students reported to be overweight/obese whereas 18.7% to be underweight. Poor and moderate SRH was found to be significantly associated with students' depression (adjusted odds ratio [AOR]: 6.700; 95% CI: 3.821–11.749 and AOR: 2.155; 95% CI: 1.582–2.934) and anxiety (AOR: 4.365; 95% CI: 2.599–7.332 and AOR: 1.776; 95% CI: 1.270–2.484). Furthermore, SRBI dissatisfaction, underweight SRBI, overweight/obese SRBI, low blood pressure and hypertension were also significantly linked with students' depression and anxiety. Conclusion: Students dissatisfied with their physical health status had higher chances to suffer from depression and anxiety. The findings of this study would create room for further research and could be used to design a comprehensive health programme for young students.

Keywords	Self-perception; Physical health; Depression; Anxiety; University students; Bangladesh

Corresponding Author	Sahadat Hossain
Corresponding Author's Institution	Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh.
Order of Authors	Sahadat Hossain, Afifa Anjum, M. Tasdik Hasan, Md. Elias Uddin, Md. Hossain, Md Tajuddin Sikder

Suggested reviewers	helal ahmed, Fahad Ahmed, Tanjir Rashid Soron, Enryka Christopher

Submission Files Included in this PDF

File Name [File Type]

JAD_2019_1198_R2_Cover Letter.docx [Cover Letter]

JAD_2019_1198_R2_Responses to the reviewer's comments.docx [Response to Reviewers]

JAD_2019_1198_R2_Highlights.docx [Highlights]

JAD_2019_1198_R2_Abstract.docx [Abstract]

JAD_2019_1198_R2_Title page.docx [Title Page (with Author Details)]

JAD_2019_1198_R2_Main manuscript_Final_Nov08.docx [Manuscript File]

JAD_2019_1198_R2_Tables.docx [Table]

Conflict of interest.docx [Conflict of Interest]

Authorship statement.pdf [Author Statement]

To view all the submission files, including those not included in the PDF, click on the manuscript title on your EVISE Homepage, then click 'Download zip file'.

November 9, 2019

Professor J. C. Soares
The Editor-in-Chief
Journal of Affective Disorders
ELSEVIER

Dear Professor,

I write to resubmit my revised manuscript (Ref: JAD_2019_1198_R2) for consideration of publication in the Journal of Affective Disorders. The manuscript is entitled "*Self-perception of physical health conditions and its association with depression and anxiety among Bangladeshi university students"*.

During the revision of the manuscript we considered all the comments of the reviewer carefully. Necessary changes have been made in the revised manuscript. We have highlighted all the changed texts throughout the manuscript in yellow for ensuring the visibility of the revision. In addition, a file with point by point response to the comments of the reviewer has been added.

We hope that your editorial choice and consideration will find it worthy of publication.

Thank you very much.

Sincerely yours,

Sahadat Hossain
Corresponding author

Point by point response to the comments of the reviewer

Sl.	Reviewer's comments	Response from the authors
1	General comment: Overall this is a great improvement from the first draft. There are very few minor changes to improve the clarity of the results section, otherwise I approve this for publication. Additionally, the manuscript would benefit aesthetically from some grammatical edits and corrections to spelling, but I am sure that the editorial team at JAD will be able to improve upon these minor points. The few suggestions I have are below.	We would like to express our sincere gratitude to the reviewer for outstanding intellectual feedback. We have addressed your suggestions appropriately throughout the manuscript during this revision. All the changed texts have highlighted in yellow for ensuring the visibility of the revision.
2	**Methods** - The explanation of the selection of participants is much clearer, thank you. - Thank you also for adding in more information about the measures- this is very helpful. - 2.3.1- Small typo in anthropometrics section: Jewellery instead of jewelleries- it is a mass noun - 2.3.1- I understand that adding in the sentence about how the female students had their BMI measured was in response to another author's suggestion. However, this addition in its current format runs the risk of sounding strange and off to female readers from a western culture. Perhaps you might want to clarify that this level of care was taken particularly with female participants because of the amount of cultural sensitivity surrounding female participants interacting with male researchers in contexts of body measurements in this setting.	• Thank you for your appreciation. • 2.3.1: Yes, you identified the typo correctly. The term 'jewelleries' has been replaced with 'jewellery' in this revised manuscript. • Considering your suggestion, we have modified the statement with clarification as follows: *In addition, it should be noted that because of the cultural sensitivity surrounding female participants interacting with male researchers in contexts of body measurements in the study setting, the anthropometric measurements of the female participants were taken separately by the specially trained female research personnel who took utmost care and caution in measurement and collecting data from them.*
3	**Results**: - 3.2 - these sentences could be made more concise: "Nevertheless, the difference in male and female participants' perceptions of SRBI was statistically significant ($\chi 2=25.61$; $p<0.001$). 25.6% of the students reported 'overweight/obese' SRBI, where majority were females. Besides, underweight SRBI was reported by 18.7% of the students, most of them being males." "Nevertheless, the difference between male and female participants' perceptions of SRBI was statistically significant ($\chi 2=25.61$; $p<0.001$), with the majority of the 25.6% of students reporting themselves as	• 3.2: Thank you very much for your clear and concise statement on these sentences. We have accepted your proposed concise sentences in our revised manuscript.

	‘overweight/obese’ SRBI being female and the majority of the 18.7% of students reporting themselves as ‘underweight’ SRBI being male. - 3.3- please be careful with the wording of “risks” and “odds” - this is an odds ratio, not a risks ratio, so it would be incorrect to say there is greater risk “In addition, significantly greater risks of depression were found among students with LBP (OR: 2.184; 95% CI: 1.386 – 3.440) and those with hypertension (OR: 3.851; 95% CI: 1.930 – 7.684).” - 3.3- What does this sentence mean? “Furthermore, although adjusted analysis did not show any significant relationship between underweight SRBI and depression, the respondents with underweight SRBI were found more likely to be depressed.” When looking at the tables, I see that the adjusted ORs indicate that those with SRBI have a p-value of 0.091, which matches the first half of your sentence and makes the first half of your sentence correct. However, the second half of the sentence is quite confusing. Are you referring to those with actual underweight BMI (p val of 0.078)? It may be best to just state that there was no association between underweight SRBI and depression after adjusting the analysis and leave it at that: “Adjusted analysis did not show any significant relationship between underweight SRBI and depression.”	• 3.3: Yes, we did not calculate risk ratio, rather we calculated odds ratio. Therefore, considering your valuable suggestion, necessary changes have been made for the wording of “risks” throughout the manuscript in this revision. • It has been corrected according to the reviewer’s suggestion.
4	**Discussion** - Again, you use the word “risks” instead of “odds” - please be careful. - Thank you for expanding the limitations section, this is much better	• Considering the suggestion of the reviewer, necessary changes have been made for the wording of “risks” throughout the manuscript in this revision.

Highlights

• This is the first study reporting on the Bangladeshi university students' self-perception of physical health conditions and its association with depression and anxiety.

• There was no gender-specific difference in the prevalence of poor (13.9%), moderate (47.8%) and good (38.2%) self-rated health among the university students in Bangladesh.

• Poor self-rated health was found significantly associated with higher likelihood of depression (AOR: 6.700; 95% CI: 3.821–11.749) and anxiety (AOR: 4.365; 95% CI: 2.599–7.332) among the students.

• Students' depression and anxiety were inextricably linked with self-rated body image dissatisfaction, status of being underweight and overweight/obese, low blood pressure and hypertension.

Abstract

Background: Self-perception of physical health conditions is associated with depression and anxiety. Although some recent studies revealed a high prevalence of depression and anxiety among Bangladeshi university students, no study has yet investigated the link between self-perception of physical health and these common psychological disorders. Therefore, this study aimed to explore the association of self-perception of physical health conditions with depression and anxiety among university students in Dhaka, Bangladesh.

Methods: A cross-sectional study was conducted between August and November 2017 among 897 undergraduate students of Jahangirnagar University, Dhaka through face-to-face interviews using a semi-structured questionnaire. Chi-square test and binary logistic regression analysis were used to examine the association between the variables.

Results: 13.9% of the respondents had poor self-rated health (SRH) and 49.9% had self-rated body image (SRBI) dissatisfaction. 25.6% of the students reported to be overweight/obese whereas 18.7% to be underweight. Poor and moderate SRH was found to be significantly associated with students' depression (adjusted odds ratio [AOR]: 6.700; 95% CI: 3.821–11.749 and AOR: 2.155; 95% CI: 1.582–2.934) and anxiety (AOR: 4.365; 95% CI: 2.599–7.332 and AOR: 1.776; 95% CI: 1.270–2.484). Furthermore, SRBI dissatisfaction, underweight SRBI, overweight/obese SRBI, low blood pressure and hypertension were also significantly linked with students' depression and anxiety.

Conclusion: Students dissatisfied with their physical health status had higher chances to suffer from depression and anxiety. The findings of this study would create room for further research and could be used to design a comprehensive health programme for young students.

Keywords

Self-perception; Physical health; Depression; Anxiety; University students; Bangladesh

Title page

Self-perception of physical health conditions and its association with depression and anxiety among Bangladeshi university students

Sahadat Hossain [a, b, *], Afifa Anjum [a], M. Tasdik Hasan [c], Md. Elias Uddin [d], Md. Shakhaoat Hossain [a], Md. Tajuddin Sikder [a]

[a] *Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh*

[b] *Maternal and Child Health Division, International Centre for Diarrhoeal Diseases Research, Bangladesh (icddr,b), 68, Shahid Tajuddin Sarani, Mohakhali, Dhaka 1212, Bangladesh*

[c] *Research Assistant, Department of Psychological Sciences, University of Liverpool*

[d] *Department of English, University of Dhaka, Dhaka 1000, Bangladesh*

[*] **Corresponding Author.**

E-mail address: sahadathossain.phi.ju@gmail.com (S. Hossain).

ORCID: 0000-0001-9433-202X

1. Introduction

Mental health is an integral component of human health. It is defined by the World Health Organization (WHO) as "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" (WHO 2018). However, an apathy towards this state of well-being is documented approximately in 1 in every 3 individuals during their lifetime (Vigo et al. 2016). Mental disorders contribute to the global burden of diseases to a great extent as they are estimated to account for 32·4% of years lived with disability (YLDs) and 13·0% of disability-adjusted life-years (DALYs) (Vigo et al. 2016).

Depression and anxiety are the most common mental health disorders experienced by the world population where approximately 322 million people suffer from depression and 264 million from anxiety (WHO 2017). The onset of these disorders is reported to occur in the very early stage of life, especially during adolescence, and the susceptible development occurs during the age of 18 – 25 years, which may coincide with the university life for many young adults (Hossain et al. 2019; Patel et al. 2007; Tegethoff et al. 2016). University period is considered a critical phase of life when the students undergo a transition from adolescence to adulthood, and are required to make various key decisions about their life and career (Hossain et al. 2019). During this time, they experience tremendous pressures resulting predominantly from academic demands, interpersonal relationships, economic stress, and struggles over making crucial decisions (Ngin et al. 2018). Therefore, the high prevalence of depression and anxiety among the university students has emerged as a serious public health concern all over the globe (Ibrahim et al. 2013; Sarokhani et al. 2013; Tran et al. 2017). Researches show a wide range of prevalence of depression from 10% to 85% with a weighted mean of 30.6% among the university students (Ibrahim et al. 2013; Ngin et al. 2018). Similarly, the prevalence of anxiety ranged from 38% to 86.5% (Singh et al. 2017; Wong et al. 2016). A recent study on

university students in Bangladesh reported that the prevalence of moderate to severe depression and anxiety was 46.8% and 33.4% respectively (Hossain et al. 2019). It also showed that over a 15-month period, the incidence rate of depression and anxiety was 19.23% and 19.86% respectively among the university students. Ngin et al. identified some factors influencing university students' mental health, such as socio-cultural dimensions (e.g. socioeconomic background), nurture-related facets (e.g. psychological abuse) and individual behaviour (e.g. negative perception of health status) (Ngin et al. 2018).

Self-rated health (SRH) refers to an individual's perception of his or her current health and has been shown to be a strong predictor of morbidity, hospitalization, and mortality (Fayers and Sprangers 2002; Vie et al. 2019). In psychological research, it is generally used as a reliable and valid measure for assessing the subjective and objective health of individuals (Mikolajczyk et al. 2008). It reflects the signs of ill health that are not bio-medically traceable or that are not included in the medical examination/ diagnostic protocol (Eriksson et al. 2001). Studies have shown an inextricable link between SRH and many lifestyle-related diseases such as diabetes and hypertension (Vie et al. 2019; Xu et al. 2019), life-style habits such as smoking status (Wang et al. 2012), daily physical activity (Tsai et al. 2010), obesity (Krause and Lampert 2015), and other mortalities. Again, researchers have identified a link between SRH and psychological health. Recent studies reported that poor SRH status had a significant association with depressive and anxiety symptoms among university students in Canada (Othman et al. 2019), Germany (Hilger-Kolb et al. 2018) and United Kingdom (El Ansari et al. 2018). Although there is a scarcity of research literature on the association between SRH and psychological health among the university students in low- and middle-income countries (LMICs), some population-based studies among older adults found such relationship. In China, a population-based cohort study showed that individuals with major depression were more likely to report poor SRH, and SRH status was significantly associated with incidences of

ischemic heart disease (Dong et al. 2017). Studies further revealed that mental disorders had the largest negative impact on SRH, and poor SRH was linked with ample risks of diseases and high rates of mortality among the older adults in LMICs such as China, India and Latin America (Falk et al. 2017; Nery Guimarães et al. 2012). However, there is a significant difference in the prevalence of SRH among the population of LMICs and high-income countries. Xu et al. reported that the older adults in China were much more likely to rate their health as being poorer than the US older adults, and the odds of having better versus poorer health was almost five times greater in the USA(Xu et al. 2019).

Self-rated body image (SRBI) is a psychological construct which refers to an individual's self-perception of his/her body linked with self-image and feelings (Lukianowicz 2018). It can significantly affect an individual's perception of and interaction with the surrounding environment. Individuals with a distorted body image might suffer from low self-concept or have poor feelings of self-worth. Studies showed that body image distortion was significantly linked with stress and depression (Kim and Lee 2010; Lee and Lee 2016). Studies further revealed that both self-rated underweight and overweight male adolescents suffered from significantly increased levels of depression, compared to those with accurate self-perceptions of body weight in the United States (Van Eck et al. 2018), Turkey (Ozmen et al. 2007) and Korea (Lee and Lee 2016). Besides, their increased depressive symptoms lingered into early adulthood. This poor mental health status due to SRBI perceptions reduces the adolescents' self-esteem, school achievement and quality of life (Florin et al. 2011; Lee and Lee 2016).

Blood pressure (BP) is the pressure exerted by blood flow against the walls of blood vessels (Mucci et al. 2016). Low blood pressure (LBP) or hypertension is a medical and public heath challenge around the globe. It is widely recognized that hypertension is a leading contributor to the global disease burden and mortality, causing more than 10 million deaths

every year (Forouzanfar et al. 2017). Furthermore, in psychological health research, both LBP and hypertension were found significantly associated with depression and anxiety (Cuffee et al. 2014; Hildrum et al. 2011; Peltzer et al. 2017).

Studies in developed countries showed that students' attitude towards SRH status, negative perceptions of SRBI, and BP status had a causal relationship with their mental health disorders (Mikolajczyk et al. 2008; Mucci et al. 2016; Ngin et al. 2018; Vie et al. 2019). However, little is known about the relationship of mental health disorders with SRH status, SRBI and BP status among the students of developing countries like Bangladesh although the prevalence of mental health disorders among the youths is increasing day by day in the country (Hossain et al. 2019). A few studies (Razzaque et al. 2010; Tareque et al. 2015) investigated the status of SRH among the older and general population of Bangladesh; however, none of them addressed the relationship of SRH with mental health disorders like depression and anxiety among the country's youths or university students. Thus, there is a considerable gap in research in this area, which demands adequate attention. Therefore, this study aimed to investigate the association of self-rated physical health conditions with depression and anxiety among university students in Dhaka, Bangladesh.

2. Methods

2.1 Study design and area

A cross-sectional study was conducted between August and November of 2017 among the undergraduate students of Jahangirnagar University, the only fully residential public university in Bangladesh, located approximately 30 kilometres away from the downtown area of Dhaka city.

2.2 Study procedures

We invited a representative cohort of 1140 students voluntarily involved in a longitudinal study which started from April 2016 [details elsewhere (Hossain et al. 2019)]. At the beginning of the longitudinal study, we made a population list, and selected the sample from the list using stratified random sampling (SRS). Out of 2060, 1140 students were randomly selected (accepting a 2% margin of error) for the longitudinal study. However, a total of 897 students participated in the present study, with a response rate of 78.68%. Data were collected by using a pre-developed questionnaire, consisting of: i) socio-demographic information, ii) information about self-perceived physical health conditions including SRH, SRBI and BP, and iii) psychological health information including a nine-item scale, the Patient Health Questionnaire-9 (PHQ-9) for assessing the level of depression, and a 7-item scale, the Generalized Anxiety Disorder-7 (GAD-7) for assessing the level of anxiety. The PHQ-9 is reported to possess high sensitivity (89.5%) and specificity (94%) for detecting major depression (Kroenke et al. 2010), and the GAD-7 is reported to have good sensitivity (89%) and specificity (82%) for measuring the severity of anxiety (Lowe et al. 2008) among both clinical and general population samples. Furthermore, large epidemiological studies used these tools for investigating the prevalence of depression and anxiety among tertiary-level students (Farrer et al. 2016). Therefore, in the present study we used the standardized Bangla version of the PHQ-9 and GAD-7 in our study, translated from the original English version. The questionnaire was reviewed and approved by an expert questionnaire review panel consisting of four members – a professor of public health, a professor of statistics, and two other experts in public health research. Assuming a 0.05 problem prevalence on the draft questionnaire, it was pre-tested with 50 students to achieve a power of 90% (Perneger et al. 2015). After necessary modification, face-to-face interviews using the final questionnaire were conducted in order to collect field data. Each interview

usually took around 30-45 minutes, and the field coordinator checked and reviewed all the questionnaires on a daily basis.

2.3 Measurements

2.3.1 Anthropometrics

For the calculation of body mass index (BMI), students' weight in kg and height in cm were measured using the ZZJKH-01 weight and height scale. At the time of measurement, the students wore light clothing, whereas their wristwatch, jewellery and shoes were removed. In addition, it should be noted that because of the cultural sensitivity surrounding female participants interacting with male researchers in contexts of body measurements in the study setting, the anthropometric measurements of the female participants were taken separately by the specially trained female research personnel who took utmost care and caution in measurement and collecting data from them. BMI was calculated as weight in kg/height in m^2. The BMI cut-off points used in the study were BMI <18.50 kg/m^2 for underweight body mass status, BMI 18.50 kg/m2–22.99 kg/m^2 for normal body weight, BMI 23.00 kg/m^2–24.99 kg/m^2 for overweight body mass status, and BMI ≥ 25 kg/m^2 for obese body mass status (Bukht et al. 2019; Hossain et al. 2018; Siddiquee et al. 2015).

2.3.2 Physical Health

The participants' perception about the condition of their physical health was assessed by using a multi-item questionnaire covering information related to SRH, SRBI and BP status. The questionnaire included a five-point Likert scale for measuring SRH and SRBI. To measure SRH, students were asked to rate their physical, psychological, and overall health with five response options: *1= very good, 2= good, 3= moderate, 4= poor and 5= very poor*. For determining the SRBI, they were asked two questions: the first question, '*Do you have any*

dissatisfaction with body image?' with '*yes*' and '*no*' response options, and the second one, '*How do you perceive your current body image?*' with four response options: *1= underweight, 2= normal/healthy weight, 3= overweight, 4= obese*. Again, to know the students' BP status, they were asked whether they got their BP measured by a registered medical doctor over the last one year. In case of positive responses to this question, the participants were further asked to mention the category of their BP based on the doctor's report. The question asked had the following three response options for recording the BP category: *1= normal BP (between 60-120 mm/Hg), 2= below the normal level/ low BP (bottom reading below 60 mm/Hg and top reading below 90 mm/Hg), 3= above the normal level/ high BP (bottom reading above 80 mm/Hg and top reading above 120 mm/Hg)* (BPA 2008).

2.3.3 Depression and anxiety

This study used the validated tool, PHQ-9, corresponding to DSM-IV Diagnostic Criteria of symptoms for major depressive disorder (Wege et al. 2016). Participants were asked how often they suffered from each of the depressive symptoms over the last 14 days with four response options: *not at all, several days, more than half of the days, and nearly every day*. The response options were also treated as a continuous ordinal measure. Therefore, the range of scores of PHQ-9 was 0 to 27. A cut-off score ≥ 10 was set as 'depression positive' for analysis in this study (Ngasa et al. 2017).

Furthermore, to identify the level of severity of anxiety disorders among the students, the validated tool, GAD-7, was used (Lowe et al. 2008). Participants were asked how often they were bothered by each of the seven core symptoms of GAD, with four response options as in PHQ-9. The response options were also calculated as a continuous ordinal measure. Therefore, the range of scores of the GAD-7 was 0 to 21. Like the depression cut-off score, GAD-7 ≥ 10 was set as 'anxiety positive' (Wege et al. 2016).

2.4 Statistical analysis

Data analysis included descriptive statistics as well as inferential statistics approaches. Descriptive statistics for categorical variables included frequencies and proportions. In addition, differences between categorical variables were assessed for significance, using the chi-square test. To explore the association between variables of self-perceived physical health conditions and outcome variables, binary logistic regression analysis was performed. Adjusted and unadjusted odds ratios (ORs) with 95% confidence intervals were reported. The level of significance was $p<0.05$. All data were analysed using the SPSS 22.0 version (Chicago, IL, USA).

3. Results

3.1 Socio-demographic characteristics

Among 897 participants, 402 (44.8%) were females and 495 (55.2%) were males (Table 1). Majority of the participants (62.4%) were more than 20 years old. However, the mean age of the participants was 21.2 (±0.83) years. 23.9% of the participants were from the faculty of arts and humanities, 16.1% from the faculty of biological sciences, 14.8% from the faculty of business studies, 22% from the faculty of mathematical and physical sciences, and 23.3% from the faculty of social sciences. About half of the participants were from medium size family (5–7 members). The highest reported occupation for fathers was business (26.5%) whereas for mothers, it was homemaker (80.2%). More than one-third (35.5%) of the participants reported a monthly expenditure of >5,000 Bangladeshi takas (59.52 USD). Furthermore, a monthly expenditure of ≤3,000 Bangladeshi takas (35.71 USD) was reported by about 10% of the respondents.

3.2 Students' perceptions about physical health conditions

38.2% of the students (39.2% males and 37.1% females) reported that their current health status was good (Table 2). Almost half (47.8%) of the students stated that their health condition was moderate, neither good nor poor. Additionally, 13.9% of the students rated their current health condition as poor. However, this study did not find any significant difference in the male and female students' perceptions of SRH status.

About half (49.9%) of the students stated that they were not satisfied with their body image, and there was no significant difference in SRBI dissatisfaction among males and females. Nevertheless, the difference between male and female participants' perceptions of SRBI was statistically significant (χ^2=25.61; p<0.001), with the majority of the 25.6% of students reporting themselves as 'overweight/obese' SRBI being female and the majority of the 18.7% of students reporting themselves as 'underweight' SRBI being male.

In case of self-reported BP status, it was found that majority of the students (56.5%) were unaware of their BP status. A significant difference was found in the self-perceived BP status of the male and female participants (χ^2=31.12; p<0.001), and the prevalence of LBP was higher among female students (15.9%).

3.3 Association of perceived physical health conditions on depression and anxiety

Table 3 presents the results that show the association between self-perception of physical health conditions and depression among university students. Bivariate regression analysis reveals a significant association between the variables of perceived physical health conditions and depression, with a higher likelihood of depression among students with poor SRH. Statistically significant higher odds ratios for depression were found in moderate (OR: 2.277; 95% CI: 1.691 – 3.066) and poor (OR: 9.067; 95% CI: 5.528 – 14.870) SRH. The participants who had SRBI

dissatisfaction were 2.232 times (95% CI: 1.708 – 2.917) more likely to suffer from depression than those with no SRBI dissatisfaction. Again, the ORs for depression were significantly higher among the students who reported their SRBI as underweight (OR: 2.646; 95% CI: 1.848 – 3.789) and overweight/obese (OR: 2.390; 95% CI: 1.737 – 3.287). In addition, significantly greater ORs for depression were found among students with LBP (OR: 2.184; 95% CI: 1.386 – 3.440) and those with hypertension (OR: 3.851; 95% CI: 1.930 – 7.684). The results of this study also revealed that after adjusting for perceived physical health variables, the ORs for depression changed slightly. Nevertheless, in the fully adjusted multivariate model, self-reported poor and moderate health as well as self-rated overweight/obese body image remained significantly associated with students' depression. However, adjusted analysis did not show any significant relationship between underweight SRBI and depression.

Students' SRH was also found to be associated with their anxiety (Table 4). The likelihood of suffering from anxiety was significantly higher among the students who reported moderate (Adjusted Odds Ratio [AOR]: 1.776; 95% CI: 1.270 – 2.484) and poor (AOR: 4.365; 95% CI: 2.599 – 7.332) SRH. Bivariate regression analysis reveals that the students who had SRBI dissatisfaction were 1.863 times (95% CI: 1.405 – 2.470) more likely to suffer from anxiety than those with no SRBI dissatisfaction. Although the bivariate regression analysis shows a significant relationship of students' anxiety with both underweight and overweight/obese SRBI, multivariate analysis reveals that only underweight (AOR: 1.714; 95% CI: 1.077 – 2.727) SRBI is significantly associated with anxiety. Again, both LBP and hypertension were found significantly linked with anxiety in unadjusted regression model. However, the adjusted multivariate model reveals that only hypertension had a significant association with anxiety (AOR: 2.459; 95% CI: 1.239 – 4.883).

4. Discussion

This study explored the impact of perceived physical health conditions on depression and anxiety in a cohort of Bangladeshi university students. It demonstrated that perceived poor health, body image dissatisfaction, status of being underweight and overweight/obese, LBP and hypertension were significantly associated with higher ORs for depression and anxiety.

The study revealed that about 14% of the participants perceived their health to be poor, which is consistent with the findings of a US study (Foti and Eaton 2010). However, this prevalence is relatively lower than the prevalence of poor SRH among the university students (34.4%) in Egypt (El Ansari and Stock 2016). In addition, the prevalence of our study is much higher than that of poor SRH among the university students in developed countries: 5.8% in the United Kingdom (El Ansari and Stock 2010), and 4.14% in Sweden (Vaez and Laflamme 2003). Some previous studies reported a gender-based difference in SRH status (Farazi and Tania 2014; Mikolajczyk et al. 2008), but this study did not find any such relationship. The finding of our study agrees with the observation that gender was not significantly associated with SRH, which was shown in the findings of studies on university students' SRH status from 26 low, middle and high-income countries (Assari and Kumar 2018; Pengpid et al. 2015). Again, the findings of this study confirmed an association between gender and SRBI, where male students tended to have a more positive SRBI than the females. This is supported by the findings of studies, conducted among university students in England and Denmark, showing that female students were more likely to perceive themselves as overweight than males (El Ansari et al. 2010).

Our study found that more than half of the students were not conscious about their BP. Therefore, we took the BP information from only 44% of the respondents who had their BP measured by a registered medical doctor during the last one year. Although the information about BP was missing for majority of the students, the rate of LBP and hypertension (15%) in our study was higher than that (8.34%) in a study among French university students (Tran et

al. 2017) and was lower than that (46.5%) in a study among the college students in Kuwait (Al-Majed and Sadek 2012). Our findings also indicated a relatively lower prevalence of hypertension than that (19.0%) reported in a study among a large sample of undergraduate university students across seven ASEAN countries (Peltzer et al. 2017). Besides, in agreement with the findings of previous studies (Al-Majed and Sadek 2012; Peltzer et al. 2017), our study found significant differences in the proportion of BP categories between the male and female students, and hypertension is usually more prevalent in males than females.

In consonance with previous studies (Ibrahim et al. 2013; Ngin et al. 2018; Seo et al. 2018; Tran et al. 2017), this study found significant association between SRH and depression. The participants who reported moderate and poor health condition had highly significant higher odds ratio for depression than those who reported good health condition. It indicates that the students with a self-rated poor health condition had a greater odds ratio of severe depression. This study also showed that the odds ratio of depression was significantly higher among the participants with SRBI dissatisfaction. This is supported by the findings of a study (Farrer et al. 2016) where students with body image problems had 4.67 times higher odds ratio for depression than those with no such problems. In terms of BP, like some previous studies (Cuffee et al. 2014; Peltzer et al. 2017), this study revealed that hypertension was positively related to depression. Again, the bivariate logistic regression analysis in this study found an association between LBP and depression, which is also supported by previous studies (Hildrum et al. 2007; Hildrum et al. 2011).

Like previous studies (Tran et al. 2017; Xu et al. 2011), this study found a significant association between SRH and anxiety. The participants who reported moderate and poor health condition had significantly higher odds ratio for anxiety than those who reported good health condition. It indicates that the students with a self-rated poor health condition were particularly vulnerable to anxiety. Consistent with a previous study (Farrer et al. 2016), our study showed

that the odds ratio of anxiety was significantly higher among the participants who reported SRBI dissatisfaction. As regards depression, in consistence with a previous study (Cuffee et al. 2014), this study found that hypertension was positively related to anxiety. Further, the bivariate logistic regression analysis in this study found an association between LBP and anxiety, which is supported by some previous studies (Hildrum et al. 2007; Hildrum et al. 2011).

To the best of our knowledge, this is the first study reporting on the association of self-perception of physical health conditions with depression and anxiety among university students in Bangladesh. This study followed a strong methodological procedure throughout. However, the findings of this study should be used with caution because the sample being drawn from only one public university was not representative of the student population of all Bangladeshi universities. Again, the findings of our study might not be fully applicable to the students of private or other public universities of the country because of the differences in the sociocultural environment of the universities. One further limitation of this study might result from the self-reported information which almost always involve some risk of recall bias. Yet another limitation of this study might lie in the use of self-reported BP as a variable because it involves risks of recall or report bias.

5. Conclusion

This study revealed that a sizeable proportion of Bangladeshi university students perceived their physical health to be poor or moderate. The findings revealed a significant association between students' self-perceived physical health conditions and the symptoms of depression and anxiety. It suggests that early awareness about SRH, SRBI and BP could help students to combat morbidities in their later life. Therefore, we recommend comprehensive health programmes [details elsewhere (Hossain et al. 2019)] at universities to address the numerous

factors influencing students' physical and psychological health. Such health promotion programmes might provide appropriate health knowledge to the university students and influence relevant predictors of their physical and mental health. The results of this study could also be used to inform the development of interventions to improve the physical and psychological health of university students.

Ethics approval and consent to participate

Ethical standards were maintained to the highest possible extent whilst the study was conducted. Ethical clearance certificate (Ref No: BBEC, JU/ M/ 2017(8)1) for this study was obtained from the Institutional Review Board (IRB), 'Biosafety, Biosecurity & Ethical Committee' of the Jahangirnagar University. Again, the ethical permission was taken from the respective faculty and department heads before the data collection. Furthermore, all participants read, understood, and signed a written consent form.

CRediT authorship contribution statement

Sahadat Hossain: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing - original draft, Writing - review & editing, Validation. **Afifa Anjum:** Investigation, Data curation, Writing - review & editing, Validation. **M. Tasdik Hasan:** Writing - review & editing, Validation. **Md. Elias Uddin:** Writing - review & editing, Validation. **Md. Shakhaoat Hossain:** Supervision, Validation. **Md. Tajuddin Sikder:** Writing - review & editing, Validation.

Funding

Self-funded.

Acknowledgements

We would like to thank all the participants who voluntarily offered their time, conscientiously documented their lives, and provided honest and thoughtful responses. We also thank the personnel who supported field implementation and data collection of this study. Our heartfelt thanks and gratitude are also due to the respective faculty and department heads for their permission for data collection.

Declaration of Competing Interest

The authors declare that they have no complicit of interest.

References

Al-Majed HT, Sadek AA (2012) Pre-hypertension and hypertension in college students in Kuwait: a neglected issue. Journal of family & community medicine 19(2):105-12 doi:10.4103/2230-8229.98296

Assari S, Kumar A (2018) Social Determinants of Physical Self-Rated Health among Asian Americans; Comparison of Six Ethnic Groups. Societies 8(2):24 doi:10.3390/soc8020024

BPA (2008) Blood Pressure UK: Blood pressure chart. Blood Pressure Association. In. http://www.bloodpressureuk.org/BloodPressureandyou/Thebasics/Bloodpressurechart Accessed August 31, 2019

Bukht MS, Ahmed KR, Hossain S, Masud P, Sultana S, Khanam R (2019) Association between physical activity and diabetic complications among Bangladeshi type 2 diabetic patients. Diabetes & Metabolic Syndrome: Clinical Research & Reviews 13:806-809 doi:10.1016/j.dsx.2018.11.069

Cuffee Y, Ogedegbe C, Williams NJ, Ogedegbe G, Schoenthaler A (2014) Psychosocial risk factors for hypertension: an update of the literature. Current hypertension reports 16(10):483 doi:10.1007/s11906-014-0483-3

Dong W, et al. (2017) Self-Rated Health Status and Risk of Ischemic Heart Disease in the China Kadoorie Biobank Study: A Population-Based Cohort Study. Journal of the American Heart Association 6(9) doi:10.1161/JAHA.117.006595

El Ansari W, Clausen SV, Mabhala A, Stock C (2010) How do I look? Body image perceptions among university students from England and Denmark. International journal of environmental research and public health 7(2):583-95 doi:10.3390/ijerph7020583

El Ansari W, Ssewanyana D, Stock C (2018) Behavioral Health Risk Profiles of Undergraduate University Students in England, Wales, and Northern Ireland: A Cluster Analysis. Frontiers in public health 6 doi:10.3389/fpubh.2018.00120

El Ansari W, Stock C (2010) Is the health and wellbeing of university students associated with their academic performance? Cross sectional findings from the United Kingdom. International journal of environmental research and public health 7(2):509-27 doi:10.3390/ijerph7020509

El Ansari W, Stock C (2016) Explaining the gender difference in self-rated health among university students in Egypt. Women & health 56(7):731-44 doi:10.1080/03630242.2015.1118733

Eriksson I, Undén A-L, Elofsson S (2001) Self-rated health. Comparisons between three different measures. Results from a population study. International journal of epidemiology 30(2):326-333 doi:10.1093/ije/30.2.326

Falk H, et al. (2017) Self-rated health and its association with mortality in older adults in China, India and Latin America—a 10/66 Dementia Research Group study. Age and Ageing 46(6):932-939 doi:10.1093/ageing/afx126

Farazi MMR, Tania S (2014) Mediators of university students self-rated health status: A study in Jahangirnnagar University. Daffodil International University Journal of Science and Technology 9(1):19-27

Farrer LM, Gulliver A, Bennett K, Fassnacht DB, Griffiths KM (2016) Demographic and psychosocial predictors of major depression and generalised anxiety disorder in Australian university students. BMC psychiatry 16:241 doi:10.1186/s12888-016-0961-z

Fayers PM, Sprangers MAG (2002) Understanding self-rated health. The Lancet 359(9302):187-188 doi:10.1016/s0140-6736(02)07466-4

Florin TA, Shults J, Stettler N (2011) Perception of overweight is associated with poor academic performance in US adolescents. The Journal of school health 81(11):663-70 doi:10.1111/j.1746-1561.2011.00642.x

Forouzanfar MH, et al. (2017) Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015. JAMA 317(2):165-182 doi:10.1001/jama.2016.19043

Foti K, Eaton D (2010) Associations of selected health risk behaviors with self-rated health status among U.S. high school students. Public health reports 125(5):771-81 doi:10.1177/003335491012500522

Hildrum B, Mykletun A, Stordal E, Bjelland I, Dahl AA, Holmen J (2007) Association of low blood pressure with anxiety and depression: the Nord-Trondelag Health Study. Journal of epidemiology and community health 61(1):53-8 doi:10.1136/jech.2005.044966

Hildrum B, Romild U, Holmen J (2011) Anxiety and depression lowers blood pressure: 22-year follow-up of the population based HUNT study, Norway. BMC public health 11:601 doi:10.1186/1471-2458-11-601

Hilger-Kolb J, Diehl K, Herr R, Loerbroks A (2018) Effort-reward imbalance among students at German universities: associations with self-rated health and mental health. International archives of occupational and environmental health 91(8):1011-1020 doi:10.1007/s00420-018-1342-3

Hossain S, Anjum A, Uddin ME, Rahman MA, Hossain MF (2019) Impacts of socio-cultural environment and lifestyle factors on the psychological health of university students in Bangladesh: A longitudinal study. Journal of affective disorders 256:393-403 doi:10.1016/j.jad.2019.06.001

Hossain S, Hossain MS, Anjum A, Ahmed F, Hossain MF, Uddin ME (2018) Risk modeling of non-communicable diseases using socio-demographic characteristics, lifestyle and family disease history among university students in Bangladesh. Journal of Public Health 26(5):531-43 doi:10.1007/s10389-018-0895-7

Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C (2013) A systematic review of studies of depression prevalence in university students. Journal of psychiatric research 47(3):391-400 doi:10.1016/j.jpsychires.2012.11.015

Kim M, Lee H (2010) Overestimation of own body weights in female university students: associations with lifestyles, weight control behaviors and depression. Nutr Res Pract 4(6):499-506 doi:10.4162/nrp.2010.4.6.499

Krause L, Lampert T (2015) Relation between overweight/obesity and self-rated health among adolescents in Germany. Do socio-economic status and type of school have an impact on that relation? International journal of environmental research and public health 12(2):2262-76 doi:10.3390/ijerph120202262

Kroenke K, Spitzer RL, Williams JB, Lowe B (2010) The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: a systematic review. General hospital psychiatry 32(4):345-59 doi:10.1016/j.genhosppsych.2010.03.006

Lee J, Lee Y (2016) The association of body image distortion with weight control behaviors, diet behaviors, physical activity, sadness, and suicidal ideation among Korean high school students: a cross-sectional study. BMC public health 16:39 doi:10.1186/s12889-016-2703-z

Lowe B, et al. (2008) Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. Medical care 46(3):266-74 doi:10.1097/MLR.0b013e318160d093

Lukianowicz N (2018) "Body Image" Disturbances in Psychiatric Disorders. British Journal of Psychiatry 113(494):31-47 doi:10.1192/bjp.113.494.31

Mikolajczyk RT, et al. (2008) Factors associated with self-rated health status in university students: a cross-sectional study in three European countries. BMC public health 8:215 doi:10.1186/1471-2458-8-215

Mucci N, Giorgi G, De Pasquale Ceratti S, Fiz-Perez J, Mucci F, Arcangeli G (2016) Anxiety, Stress-Related Factors, and Blood Pressure in Young Adults. Frontiers in psychology 7:1682 doi:10.3389/fpsyg.2016.01682

Nery Guimarães JM, et al. (2012) Association between self-rated health and mortality: 10 years follow-up to the Pró-Saúdecohort study. BMC public health 12(1) doi:10.1186/1471-2458-12-676

Ngasa SN, et al. (2017) Prevalence and factors associated with depression among medical students in Cameroon: a cross-sectional study. BMC psychiatry 17(1):216 doi:10.1186/s12888-017-1382-3

Ngin C, Pal K, Tuot S, Chhoun P, Yi R, Yi S (2018) Social and behavioural factors associated with depressive symptoms among university students in Cambodia: a cross-sectional study. BMJ open 8(9):e019918 doi:10.1136/bmjopen-2017-019918

Othman N, Ahmad F, El Morr C, Ritvo P (2019) Perceived impact of contextual determinants on depression, anxiety and stress: a survey with university students. International journal of mental health systems 13:17 doi:10.1186/s13033-019-0275-x

Ozmen D, et al. (2007) The association of self-esteem, depression and body satisfaction with obesity among Turkish adolescents. BMC public health 7:80 doi:10.1186/1471-2458-7-80

Patel V, Flisher AJ, Hetrick S, McGorry P (2007) Mental health of young people: a global public-health challenge. The Lancet 369(9569):1302-1313 doi:10.1016/s0140-6736(07)60368-7

Peltzer K, et al. (2017) Prehypertension and psychosocial risk factors among university students in ASEAN countries. BMC cardiovascular disorders 17(1):230 doi:10.1186/s12872-017-0666-3

Pengpid S, Peltzer K, Samuels TA, Gasparishvili A (2015) Factors associated with self-rated health status among university students from 26 low, middle and high income countries. Journal of Psychology in Africa 25(5):448-453 doi:10.1080/14330237.2015.1101274

Perneger TV, Courvoisier DS, Hudelson PM, Gayet-Ageron A (2015) Sample size for pre-tests of questionnaires. Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation 24(1):147-51 doi:10.1007/s11136-014-0752-2

Razzaque A, Nahar L, Akter Khanam M, Kim Streatfield P (2010) Socio-demographic differentials of adult health indicators in Matlab, Bangladesh: self-rated health, health state, quality of life and disability level. Global health action 3 doi:10.3402/gha.v3i0.4618

Sarokhani D, Delpisheh A, Veisani Y, Sarokhani MT, Manesh RE, Sayehmiri K (2013) Prevalence of Depression among University Students: A Systematic Review and Meta-Analysis Study. Depression research and treatment 2013:373857 doi:10.1155/2013/373857

Seo EH, Kim SG, Kim SH, Kim JH, Park JH, Yoon HJ (2018) Life satisfaction and happiness associated with depressive symptoms among university students: a cross-sectional study in Korea. Annals of general psychiatry 17:52 doi:10.1186/s12991-018-0223-1

Siddiquee T, et al. (2015) Prevalence of obesity in a rural Asian Indian (Bangladeshi) population and its determinants. BMC public health 15:860 doi:10.1186/s12889-015-2193-4

Singh M, Goel NK, Sharma MK, K. BR (2017) Prevalence of Depression, Anxiety and Stress among Students of Punjab University, Chandigarh. Natl J Community Med. National Journal of Community Medicine 8(11):666-671

Tareque MI, Saito Y, Kawahara K (2015) Healthy life expectancy and the correlates of self-rated health in Bangladesh in 1996 and 2002. BMC public health 15:312 doi:10.1186/s12889-015-1640-6

Tegethoff M, Stalujanis E, Belardi A, Meinlschmidt G (2016) Chronology of Onset of Mental Disorders and Physical Diseases in Mental-Physical Comorbidity - A National Representative Survey of Adolescents. PLoS One 11(10):e0165196 doi:10.1371/journal.pone.0165196

Tran A, et al. (2017) Health assessment of French university students and risk factors associated with mental health disorders. PLoS One 12(11):e0188187 doi:10.1371/journal.pone.0188187

Tsai J, Ford ES, Li C, Zhao G, Balluz LS (2010) Physical activity and optimal self-rated health of adults with and without diabetes. BMC public health 10:365 doi:10.1186/1471-2458-10-365

Vaez M, Laflamme L (2003) Health behaviors, self-rated health, and quality of life: a study among first-year Swedish university students. Journal of American college health : J of ACH 51(4):156-62 doi:10.1080/07448480309596344

Van Eck K, Morse M, Flory K (2018) The Role of Body Image in the Link Between ADHD and Depression Symptoms Among College Students. Journal of attention disorders 22(5):435-445 doi:10.1177/1087054715580845

Vie TL, Hufthammer KO, Meland E, Breidablik HJ (2019) Self-rated health (SRH) in young people and causes of death and mortality in young adulthood. A prospective registry-based Norwegian HUNT-study. SSM - population health 7:100364 doi:10.1016/j.ssmph.2019.100364

Vigo D, Thornicroft G, Atun R (2016) Estimating the true global burden of mental illness. The Lancet Psychiatry 3(2):171-178 doi:10.1016/s2215-0366(15)00505-2

Wang MP, Ho SY, Lo WS, Lai MK, Lam TH (2012) Smoking is associated with poor self-rated health among adolescents in Hong Kong. Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco 14(6):682-7 doi:10.1093/ntr/ntr266

Wege N, Muth T, Li J, Angerer P (2016) Mental health among currently enrolled medical students in Germany. Public health 132:92-100 doi:10.1016/j.puhe.2015.12.014

WHO (2017) Depression and Other Common Mental Disorders: Global Health Estimates. World Health Organization, Geneva. http://apps.who.int/iris/bitstream/handle/10665/254610/WHO-MSD-MER-2017.2-eng.pdf;jsessionid=79694F46E0E8DD1DCE1520C70E734C3F?sequence=1. (Access date: May 02, 2019)

WHO (2018) Mental health: strengthening our response. World Health Organization, Geneva. http://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response. (Access date: May 02, 2019)

Wong CH, Sultan Shah ZU, Teng CL, Lin TQ, Majeed ZA, Chan CW (2016) A systematic review of anxiety prevalence in adults within primary care and community settings in Malaysia. Asian journal of psychiatry 24:110-117 doi:10.1016/j.ajp.2016.08.020

Xu D, Arling G, Wang K (2019) A cross-sectional study of self-rated health among older adults: a comparison of China and the United States. BMJ open 9(7):e027895 doi:10.1136/bmjopen-2018-027895

Xu Z, Su H, Zou Y, Chen J, Wu J, Chang W (2011) Self-rated health of Chinese adolescents: distribution and its associated factors. Scandinavian journal of caring sciences 25(4):780-6 doi:10.1111/j.1471-6712.2011.00893.x

Table 1
Sociodemographic characteristics of students (n=897)

Variables	n	%
Gender		
Female	402	44.8
Male	495	55.2
Category of age		
< 20 years	15	1.7
20 years	322	35.9
> 20 years	560	62.4
Mean age (±SD)	21.2 (0.83)	
Study faculty		
Arts and humanities	214	23.9
Biological sciences	144	16.1
Business studies	133	14.8
Mathematical and physical sciences	197	22.0
Social sciences	209	23.3
Religion		
Islam	793	88.4
Hinduism	92	10.3
Christianity	2	0.2
Buddhism	10	1.1
Family size		
≤4 members	362	40.4
5–7 members	440	49.1
≥8 members	95	10.6
Father's occupation		
Advocate/banker/doctor/engineer/teacher	154	17.2
Businessman	238	26.5
Driver/farmer/labour	147	16.4
Other services	236	26.3
No job/not applicable	122	13.6
Mother's occupation		
Homemaker	719	80.2
Advocate/banker/doctor/teacher	90	10
Other services	38	4.2
No job/not applicable	50	5.6
Monthly expenditure (in BDT) [a]		
≤3,000	93	10.4
3,001–4,000	205	22.9
4,001–5,000	281	31.3
>5,000	318	35.5

Note. SD – standard deviation; BDT – Bangladeshi taka
[a] 84 (±0.50) BDT equals 1 US dollar

Table 2
Students' perceptions of physical health conditions, distributed by gender (n=897)

Variables	Total (% total)	Male (% within gender)	Female (% within gender)	χ^2-value (p-value)
Self-rated health				
Good	343 (38.2)	194 (39.2)	149 (37.1)	0.823 (0.663)
Moderate	429 (47.8)	230 (46.5)	199 (49.5)	
Poor	125 (13.9)	71 (14.3)	54 (13.4)	
Self-rated body image dissatisfaction				
Yes	448 (49.9)	246 (49.7)	202 (50.2)	0.03 (0.869)
No	449 (50.1)	249 (50.3)	200 (49.8)	
Self-rated body image				
Underweight	168 (18.7)	112 (22.6)	56 (13.9)	25.61 (<0.001)**
Normal weight	499 (55.6)	286 (57.8)	213 (53.0)	
Overweight/obese	230 (25.6)	97 (19.6)	133 (33.1)	
Self-reported blood pressure				
Low blood pressure	89 (9.9)	25 (5.1)	64 (15.9)	31.12 (<0.001)**
Normal blood pressure	255 (28.4)	155 (31.3)	100 (24.9)	
High blood pressure	46 (5.1)	29 (5.9)	17 (4.2)	
Don't know	507 (56.5)	286 (57.8)	221 (55.0)	

Note.
** $p < 0.01$

Table 3
Association between students' self-perception of physical health conditions and depression (results of bivariate and multivariate logistic regression analysis).[a]

Variable	Unadjusted		Adjusted [b]	
	ORs (95% CI)	*p*-value	ORs (95% CI)	*p*-value
Self-rated health				
Poor	9.067 (5.528 – 14.870)	<0.001	6.700 (3.821 – 11.749)	<0.001
Moderate	2.277 (1.691 – 3.066)	<0.001	2.155 (1.582 – 2.934)	<0.001
Good	1		1	
Self-rated body image dissatisfaction				
Yes	2.232 (1.708 – 2.917)	<0.001		
No	1			
Self-rated body image				
Underweight	2.646 (1.848 – 3.789)	<0.001	1.477 (0.940 – 2.321)	0.091
Overweight/obese	2.390 (1.737 – 3.287)	<0.001	1.742 (1.167 – 2.599)	0.007
Normal weight	1		1	
Actual category of BMI				
Underweight	1.194 (0.814 – 1.752)	0.365	0.662 (0.419 – 1.047)	0.078
Overweight/obese	1.183 (0.887 – 1.576)	0.252	0.918 (0.634 – 1.331)	0.653
Normal weight	1		1	
Low blood pressure				
Yes	2.184 (1.386 – 3.440)	0.001	1.514 (0.916 – 2.502)	0.106
No	1		1	
Hypertension				
Yes	3.851 (1.930 – 7.684)	<0.001	2.060 (0.963 – 4.403)	0.062
No	1		1	

Note. OR – odds ratio; CI – confidence interval; BMI – body mass index.
[a] Estimates are based on binary logistic regression with depression, PHQ-9≥10 scores, as dependent variable.
[b] Adjusted for all presented variables in the table except body weight dissatisfaction.

Table 4
Association between students' self-perception of physical health conditions and anxiety (results of bivariate and multivariate logistic regression analysis).[a]

Variable	Unadjusted		Adjusted [b]	
	ORs (95% CI)	*p*-value	ORs (95% CI)	*p*-value
Self-rated health				
Poor	5.732 (3.684 – 8.919)	<0.001	4.365 (2.599 – 7.332)	<0.001
Moderate	1.863 (1.347 – 2.577)	<0.001	1.776 (1.270 – 2.484)	0.001
Good	1		1	
Self-rated body image dissatisfaction				
Yes	1.863 (1.405 – 2.470)	<0.001		
No	1			
Self-rated body image				
Underweight	2.369 (1.647 – 3.410)	<0.001	1.714 (1.077 – 2.727)	0.023
Overweight/obese	1.982 (1.424 – 2.759)	<0.001	1.279 (0.842 – 2.943)	0.249
Normal weight	1			
Actual category of BMI				
Underweight	1.002 (0.665 – 1.510)	0.993	0.557 (0.342 – 0.907)	0.019
Overweight/obese	1.184 (0.875 – 1.603)	0.273	1.061 (0.716 – 1.571)	0.769
Normal weight	1		1	
Low blood pressure				
Yes	1.562 (1.001 – 2.437)	0.050	1.187 (0.722 – 1.950)	0.499
No	1		1	
Hypertension				
Yes	4.057 (2.174 – 7.569)	<0.001	2.459 (1.239 – 4.883)	0.010
No	1		1	

Note. OR – odds ratio; CI – confidence interval; BMI – body mass index.
[a] Estimates are based on binary logistic regression with anxiety, GAD-7≥10 scores, as dependent variable.
[b] Adjusted for all presented variables in the table except body weight dissatisfaction.

Conflict of interest

The authors declare that they have no conflict of interest.

AUTHORSHIP STATEMENT

Manuscript title: Self-perception of physical health and its association with depression and anxiety among Bangladeshi university students

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication before its appearance in the *Journal of Affective Disorder*.

Authorship contributions

Please indicate the specific contributions made by each author. The name of each author must appear at least once in each of the three categories below.

Category 1

Conception and design of study: Sahadat Hossain,

Acquisition of data: Sahadat Hossain, Afifa Anjum,

Analysis and/or interpretation of data: Sahadat Hossain,

Category 2

Drafting the manuscript: Sahadat Hossain, Afifa Anjum.

Revising the manuscript critically for important intellectual content: M. Tasdik Hasan,

Md. Elias Uddin, Md. Shakhaoat Hossain, Md. Tajuddin Sikder.

Category 3

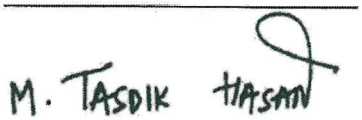
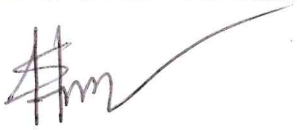
Approval of the version of the manuscript to be published (the names of all authors must be listed):

Sahadat Hossain, Afifa Anjum, M. Tasdik Hasan, Md. Elias Uddin, Md. Shakhaoat Hossain, Md. Tajuddin Sikder.

Acknowledgements

We would like to thank all the participants who voluntarily offered their time, conscientiously documented their lives, and provided honest and thoughtful responses and the personnel who supported field implementation and data collection of this study. We also duly acknowledge respective faculty and department heads for their permission and support in data collection.

This statement is signed by all the authors (*a photocopy of this form may be used if there are more than 10 authors*)**:**

Author's name (typed)	Author's signature	Date
Sahadat Hossain		May 13, 2019
Afifa Anjum		May 13, 2019
M. Tasdik Hasan		May 15, 2019
Md. Elias Uddin		May 14, 2019
Md. Shakhaoat Hossain		May 18, 2019
Md. Tajuddin Sikder		May 15, 2019